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METHOD FOR DETERMINING ECONOMIC FEASIBILITY OF RESIDENTIAL DESIGN STANDARDS

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METHOD FOR DETERMINING ECONOMIC FEASIBILITY OF RESIDENTIAL DESIGN STANDARDS

I. INTRODUCTION

A part of the planning design process for residential areas is the determination of density of development. Such determination may be made from a number of different viewpoints: it might be expressed as policy indicating a specific goal or objective in relation to establishing the character of environment desired: it might emerge as the result of a logical succession of calculations based upon the ultimate capacity of the land area involved or, within a specified area the density may simply be a result of a population forecast for the area. Finally, the determination might be influenced by all of these factors.

As general guides, density standards have been developed taking into account general requirements of public health, safety and welfare. These standards might be considered as "ideal" and represent a kind of starting point in the design process. The most outstanding example of such a guide is, of course, the standards developed by the APHA in their publication Planning The Neighborhood. Such standards are susceptible not only to providing design criteria but can also be subjected to cost analyses for the derived public facility requirements.

Major questions still remain, however. The establishment of a density standard for an area not only implies a certain character in terms of physical environment but also in terms of the social and economic environment. The objective of this memorandum is to

illustrate a method for the determination of basic economic characteristics implied by any given density and housing type determination for a residential area. The method lacks comprehensiveness in that it does not provide insight into the public costs of a given area, but it does provide the means of determining the private costs: eg - average rent levels and anticipated soundness for private development.

II. BASIC APPROACH AND ASSUMPTIONS

The basic approach of the method is to assume the viewpoint of the private investor and to analyze his requirements if he were to attempt to actually develop an area in accordance with the designed plan. This approach, first of all, recognizes the competition for the investor's dollar. This simply means that the investor has to earn a certain amount from an investment in real estate or else he will invest his money in other directions such as stocks and bonds. Thus for any kind of favorable market for real estate, the earnings from real estate have to be at least as much as those earnings accruing from other forms of investment. If this situation does not exist, then it becomes necessary to set up incentives, or "subsidies" to encourage real estate development.

However, competing forms of investment are not the only factors taken into consideration. The relative safety or risk of the investment is also a strong influence, and in this regard, residential rental real estate is a notoriously risky investment. Consequently, anticipated earnings usually have to be even higher than other forms of investment. Adn even should the developer prove willing to enter into a risky venture, considerable control is exerted by the mortgage

lender and the FHA, who usually become involved since few developers have the required "free cash" to cover the entire investment.

Thus these basic factors are controlling elements in attempting to achieve new development in residential areas by private enterprise.

While the method described in the following pages is sufficiently accurate to provide the planner with some basic economic controls on his residential design standards, there are assumptions which necessarily make it impossible for absolute accuracy in results. The method is basically that which the real estate developer uses in analyzing a specific building or project except that it is extended over an entire planning area. Thus while analysis for specific buildings can be carried out with specific data, for simplicity much of the following analysis must necessarily assume values for a number of factors. These values are averages based on the past experience of a number of buildings, while actually they might vary depending on the design of the building, type of tenants, variation in service and private utilities, etc.

The results of the method provide the planner with 1) the <u>average</u> probable rent level for the entire area, and 2) the <u>average</u> probable return to the investor. It is, of course, well known that both of these factors can vary considerably from parcel to parcel and, indeed, from dwelling unit to dwelling unit within the same building. These differences arise from differences in attractiveness, convenience and a host of other factors. Consequently, this method provides only basic <u>average</u> area controls in economic terms. This arises primarily because of an attempt to simplify the method as much as possible. It is possible for the more mathematically-minded

planner to refine the analysis and introduce new results due to variation in housing types, variations in land values, and other factors. Also it is possible to carry out refinements for smaller sub-areas and project areas.

III. BASIC DATA REQUIREMENTS

Before the planner can begin to apply the method described below, certain basic information must be at hand. From current assessment records, land values in the area have to be assembled. These values can be averaged to find a single mean land value for the area, or they can be grouped into ranges depending upon the degree of refinement desired. In addition, past assessment land values can be gathered for comparison purposes to provide information concerning trends in value which can be used in developing forecasts if these are desired (this will depend very much on the relative imminence of the proposed action program).

Also required is up-to-date data on building costs. There are various sources available. The publication Engineering News-Record annually publishes current construction cost data, including costs of residential construction. The U.S. Department of Commerce and the U.S. Department of Labor, Bureau of Labor Statistics, jointly publish Construction Volume and Costs (available in the library). This is published every three months and is supplemented by a volume entitled Construction Review which provides trends in construction costs since 1915. This data is broken down into "residential" construction and "apartments, hotels and offices." In addition there are various local sources which can provide an even finer breakdown as to housing types. This building cost data should be broken down

into cost per square foot of floor area.

If demolition of existing structures is required to achieve the proposed new development, then these costs also have to be assembled. Sources for such information are available at the office of the Demolition Director (John Murray) or at the Building Department. (Some material is also available in the library: for example - demolition costs in redevelopment projects in Boston and in other cities.)

IV. THE COMPONENTS OF RENT

The rent charged to a tenant of a building, is, very simply, the sum of all the costs the owner incurs in maintaining and operating the building for the tenant plus the owner's profit. The basis of the method is nothing more than this. Complications do arise, however, when an attempt is made to calculate some of the costs to the owner. Even more important is the fact that these costs can be directly related to structural density and consequently become key factors in determining the economic conditions arising from a specific density decision.

The basic factors which comprise the total rent figure are as follows:

1. Annual charges on borrowed capital. This is also referred to as "amortization". What it simply means is the owner's obligation to meet his mortgage payments.

2. Operating and maintenance costs. These are the costs associated with keeping the dwellings being rented in a good, habitable condition. It includes paying for utility services, maintaining equipment in good working order such as bathroom facilities, kitchen stoves, etc.

3. Local property taxes*

4. A contingency allowance for possible vacancies to offset the loss in rent when they occur. This allowance can be set at 5%-10% of gross rent.

5. Profit. Obviously the owner has to have a return on his investment or he simply won't make the investment. What the average owner usually requires can be calculated in a number of ways. Here it is calculated as meeting a certain required percentage of his down-payment (known as his cash equity).

Thus to compute rent for any dwelling requires only that the analyst add all these factors, and their sum provides the necessary yearly rent for that dwelling. Determining the monthly rent, of course, only requires dividing the yearly rent by twelve.

To do this for every dwelling planned for in a planning area or project area would entail a considerable amount of work. For complete accuracy this would be necessary since each dwelling could be unique in size, shape, services received, etc. Such accuracy is not really required, however, and since the common denominator for each dwelling is a unit area of living space - in other words, the square foot of floor space - each of the above factors can be converted to average cost per square foot of floor space, and the analysis can be extended over an entire planning district.

V. CALCULATION OF COMPONENT COSTS

a. Annual Charges on Borrowed Capital

Before the annual charge on borrowed capital can be determined,

*Federal income taxes are also a factor, although in the method of analysis presented here they are not usually figured in. They are usually figured to be handled as a part of the personal or corporate income tax in total. Also special methods for determining legal deductions for depreciation, etc. require different treatment.

it is necessary to determine the total capital investment necessary to develop the contemplated dwelling accommodations. This is the sum of all of the costs which go into site preparation and construction. Thus it includes the cost of the land, the cost of the proposed structures and the cost of demolishing any existing structures standing on the site. These are all determined with respect to the total new floor space to be provided. Thus the following factors are involved:

Land cost per square foot of floor space
Building cost per square foot of floor space
Demolition cost per square foot of floor space (new)

The land cost per square foot of floor space is actually a function of the floor area rationand can be determined in the following manner:

$$\text{Land Cost/ sf floor space} = \frac{\text{Land Cost/ sf land}}{\text{sf floor space/sf land}}$$

$$\text{or} = \frac{\text{Land Cost/sf land}}{\text{F.A.R.}}$$

While F.A.R. is, of course, a measure of structural density, it can also be related to the usual expression of residential density in terms of dwellings per acre if the average size of the dwelling units can be determined. Thus:

$$\text{F.A.R.} = \frac{\text{Avg. Size/DU X Density (DU/acre)}}{43{,}560}$$

This can be substituted into the previous determination of land cost per square foot of floor space and we find that:

$$\text{Land Cost/sf floor space} = \frac{\text{Land Cost per acre}}{\text{sq. ft./DU X Density}}$$

Consequently the total capital cost can be determined as follows:

C = Building Cost/sf floor space (B)
plus
Demolition Cost (old bldgs) per sq. ft. of floor space (New bldgs) (R)
plus
$\frac{\text{Land Cost per acre}}{\text{s.f./DU X Density}}$ $\left(\frac{L}{(s)X(d)}\right)$

or $C = B + R + \frac{L}{sD}$

Having computed the total capital investment per square foot of floor space, it is relatively simple to calculate the annual amortization charge. It is assumed that most investors will attempt to minimize the actual cash outlay required to start construction. Consequently, this means that the investor will attempt to obtain a mortgage loan from a bank or insurance company. It also means that most investors will attempt to acquire mortgage insurance from the FHA. This is because most mortgage lenders will only provide up to 2/3 of the total cost as a mortgage loan whereas with FHA insurance it is possible to obtain a mortgage loan up to 90% of the required capital. However, only under unusual conditions can the full 90% be applied so that for the purposes of simplifying this method and making it as generally applicable as possible, it is assumed that investors can acquire mortgage funds for 80% of the total capital improvement. Thus:

Amount of Mortgage = .8 x C

Repayment of the mortgage includes both interest and principal over a specified number of years and the sum of these can be termed the "amortization rate". With a 25-year mortgage and a 5½% interest rate, this amortization rate calculates to be 7½%.* Thus the annual

* From: Winnick, Rental Housing, A.C.T.I.O.N., McGraw-Hill, 1958

payment would be as follows:

$$\text{(A) annual payment} = (.075)(.8)\ C = (.06)\ (C)$$

Consequently the first calculation in determining rent would be the following:

$$\text{Annual Payment (A)} = (.06)\ (B + R + \frac{L}{sD})$$

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*The amortization rate is computed as follows:

$$a = i\ \frac{(1 + i)^n}{(1 + i)^n - 1}$$

Where i - interest rate
n = period of the mortgage
a = amortization rate

It will generally not be necessary to resort to this calculation as the 7½% above will usually suffice in most situations.

b. Operating Expenses and Maintenance

Operating expenses vary considerably between various residential rental structures. Such expenses are affected by the efficiency of design of the building, the number and level of services provided, management practices, and even the variation of care of the property exhibited by the tenants. Consequently only a crude average can be utilized in applying this factor over a general planning area. This has been derived from experience recorded by various research studies carried out by the FHA and others of existing rental properties.* In general such expenses average out to be roughly one-third of gross income. In terms of cost per square foot, these have shown a range over the past few years of anywhere between 50¢ per square foot to $1.25 per square foot. As a good average figure for use in the Boston area, this cost is assumed to be $1.00 per square foot.

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*From: Winnick, Rental Housing, A.C.T.I.O.N., McGraw-Hill, 1958

c. Local Property Taxes

The local property tax can be computed by simply multiplying the total value of capital investment derived in paragraph (a) above by the tax rate. Since this capital value was found to be dependent on the density of development, then the property tax paid by the developer (and the tax yield received by the city) is dependent on density also.

Thus the annual property tax is computed as follows:

$$\text{Tax} = \frac{(\text{tax rate})}{1000} \quad (B + R + \frac{L)}{sD}$$

One major difficulty is the choice of tax rate to be used in the computation. Obviously, simply using the current rate can hardly be considered representative of a future situation. It is, nevertheless, useful to use the current rate as a measure of determining the immediate potential for rebuilding an area. The analyst is, of course, at liberty to attempt whatever forecasts he might want to develop to gain a clearer picture of future potential.

d. Profit

Every developer (except perhaps a charitable institution) is interested in obtaining the maximum profit possible from his investment. Notwithstanding this, there are limitations due to the cost of providing dwellings for rent (as described above) as well as limitations in demand. Thus there are ranges of profit which govern real estate operators, banks, insurance companies, and the FHA which are considered a "reasonable" return.

Profit as used in this method is considered in its relation to how much cash (down payment) the developer is investing in the

project. Thus the real estate operator thinks of profit in terms of how many years it will take him to get his money back. Most developers feel that a good investment is one which will return the original cash investment in 5 to 10 years, and the banks and FHA are pretty much in agreement. This is not wholly an arbitrary determination since it is based strongly on the potential for profit of competing forms of investment and a strong psychological feeling of great risk in residential real estate investment. Thus for a developer to have his down payment returned to him in 5 or 10 years means that annually he has to earn between 10% and 20% of the amount of the down payment.

As indicated before, it has been assumed that 80% of the total capital has been provided in a mortgage loan. This means that the developer has to make a down payment of 20%. Thus 20% of the total capital value is considered the cash equity and the amount of profit that must be earned is the product of this cash equity and the rate of return. Thus:

$$\text{Profit } (Y) = (j)\ (.20)\ (B + R + \frac{L)}{sD}$$

Where (j) is the rate of return or rate of earning in relation to the cash equity.

The choice of values for (j) are dependent on what the analyst is trying to determine, but generally the following evaluation of ranges of (j) is useful:

15% and over -- Prime investment opportunity

12% to 15% -- Good investment opportunity

10% to 12% -- Fair investment opportunity

under 10% -- Poor investment opportunity

Usually if the return is anticipated at under 10% of total cash equity it is impossible to achieve development by private enterprise. Even were the real estate operator willing to enter into such a risky venture, it is highly doubtful that a bank or other lending institution would grant a mortgage or that the FHA would underwrite such a mortgage. Thus, while on the surface the 10% figure might seem arbitrary, it represents a strong influence on the processes of real estate development.

c. Total Annual Rent

Total annual rent is determined simply by adding up all of the above factors: amortization, operating and maintenance costs, local property taxes, and profit. This sum is then divided by 0.95 to allow for a 5% vacancy allowance and the final result is the total annual rent figure.

VI. A NUMERICAL EXAMPLE

To illustrate each of the calculations outlined above, it is worthwhile to consider a numerical example.

If it is assumed that a private developer were to purchase an entire area slated for redevelopment in Roxbury and construct housing in accordance with the district plan for the area with no governmental assistance whatever, it is then fairly easy to calculate what the monthly rent of a typical dwelling unit would have to be.

First of all, assume the following conditions have been determined:

Proposed density of development: 80 du's per net acre.
Number of dwelling units proposed: 1100
Average size of proposed units: 800 sq. ft.
Number of existing units to be demolished: 1000

Building Cost/ sq. ft. floor space: $17.00
Land Cost/ sq. ft. land area: $5 or land cost per acre : $200,000

Demolition Cost/ existing unit: $1000

Demolition Cost/sq. ft. of new floor space = $\frac{\$1000 \times 1000 \text{ units}}{800 \times 1100} = \$1.14$

a. Amortization

Total Capital Cost: $B + R + \frac{L}{sD}$

$$\$17.00 + 1.14 + \frac{200{,}000}{800 \times 80} = \$21.27 \text{ / sq. ft. floor space}$$

Amortization: (.06) ($21.27) = $1.28/ sq.ft. floor space/ year

b. Operating Expenses

Operating Expenses and Maintenance = $1.00/sf floor space/year

c. Taxes

Current Tax Rate: $101.20

Tax Bill: $\frac{101.20}{1000} \times \$21.27 = \$2.15$/sf floor space/year

d. Profit

Profit = (.10) (.20) ($21.27) = $0.43/sf floor space/year

Using 10% a s the rate of return on equity establishes the fact that what is being computed is the minimum possible rent.

e. Total Rent

Rent =	$1.28/sf floor space/year	(Amortization)
	1.00/ " " " "	(Operating Exp.)
	2.15 " " " "	(Taxes)
	0.43 " " " "	(Profit)
	$4.86	
	.95	(vacancy allowance)

Total Rent = $5.12/sf floor space/year

f. Monthly Rent

$$\text{Monthly Rent} = \frac{5.12 \times 800 \text{ sf/du}}{12}$$

Rent = $342 per month.

The final monthly rent figure derived is hardly one which the average family in Roxbury could afford to pay. This is of course readily seen in Roxbury which is known as a low income area. For other areas, some basic knowledge of either the people presently living in the area, or, if different, the people likely to live in the project is necessary to relate the significance of the derived rental figure and this is discussed below. A s mentioned, however, for Roxbury, it is clearly evident that private enterprise would be unable to accomplish such a project.

How much would Federal and City redevelopment aid provide incentive for rebuilding? Under these circumstances private enterprise does not have to worry about the cost of demolishing existing structures and they would probably buy the land from the Redevelopment Authority at, say, 70¢ per sq. ft. or $28,000 per acre. Then the capital cost would be: $17.00 + 0 + $\frac{28,000}{800 \times 80}$ = $17.44/sf floor space

Then:	Amortization:	$1.05/sf/year
	Operations:	1.00/sf/year
	Taxes:	1.76/sf/year
	Profit:	0.35/sf/year
		$4.16
	Vacancy:	.95

Total Rent: $4.38/sf/year
Monthly Rent: $292 per month

Thus the normal Federal and City redevelopment process provides a measure of assistance, and in this illustration would cut the minimum required monthly rent by $50. However, $292 per month is still high rent for all but high income families. It still is not within what would be considered a reasonable level for Roxbury.

Another method of providing still further incentive is through a tax concession. If, as an example, assessment was set at 50% of construction cost rather than 100% then the required taxes would only be $0.88/sf/year and rent would go

down to $3.46/sf/year or $230 per month. Thus, through this incentive, monthly rent is cut another $62 per month. It is quite evident, however, that it is still not enough.

There are other ways in which the formula may be analyzed. For example, an additional way to reduce rent is to increase density, since the two are inversely proportional. This is an area for critical and careful planning analysis, however, to determine whether or not planning standards are being sacrificed. It might be assumed that technology will advance in future years to materially cut building costs or considerable liberalization of financing arrangements could materially reduce amortization payments. These are quite unlikely, but the effects of such changes could be analyzed. Reduction of operating costs is another possibility, but again unlikely.

Added to these possibilities, might be direct subsidies from either Federal, State or city governments. For example if a Federally-aided redevelopment project was involved, a 50% tax valuation, and a 50% direct subsidy to cover the cost of construction then the monthly rent would be reduced to $182 per month.

Thus from a basic starting point of $342 per month rent under conditions of private enterprise carrying out the project alone, by a succession of subsidies, concessions, etc., it can be seen that the rent could be cut by $160 per month to a figure of $182.

VII. DETERMINATION OF HOW MUCH RENT CAN BE AFFORDED

Determination of how much rent can be afforded is, of course, a function of the housing market for any particular area, and the likely future housing market. However, in an area in which it is expected that future plans call for re-housing substantially the same population, certain rules of thumb can be applied using Census data as the starting point. For each district in the city there is avail-

able median income data for all households residing in the area in 1950. This median income figure can be updated by applying factors measuring the change in consumer income between 1950 and the present to provide an estimate of present median income. An additional expansion factor can be applied to arrive at average income rather than median. From this estimate of current average income, an assumed portion available for housing can then be determined which provides a quick estimate of how much rent the average family in the district can afford. As a numerical example, Roxbury might again serve as a model. In 1950 median income was $2447. Incomes have advanced approximately 20% to the middle of 1958. Thus:

$$\text{1958 Est. Median Income} = 2447 + (.2)(2447)$$
$$= 2936$$

The spread between median income and average income varies in different localities, but it can reasonably be assumed to be about 5%. Thus:

$$\text{1958 Est. Avg. Income} = 2936 + (.05)(2936)$$
$$= \$3083$$

If it is assumed that the average Roxbury family can spend no more than 20% of its gross income on housing then:

$$\text{Average Monthly Rent Paying Ability (Roxbury)} = \frac{\$3083\ (.20)}{12}$$
$$= \$52 \text{ per month.}$$

If the average family is willing to spend 25% of its income on housing then presumably, by the same calculations, the average rent paying ability is $64 per month. If 33% of the average income were devoted to rent, then the average rent paying ability would be $86 per month.

Actually research on consumer expenditures reveals that the portion of income devoted to rent varies with income: for low incomes a very high portion is

spent for housing; for high incomes a low portion is spent for housing. But in any event the general range lies between 15% and 30%, so that an estimated rent range of from $50-$75 per month for Roxbury would be a reasonable estimate of the average rent-paying ability of the families currently living there.

This method of estimation can be used with reasonable reliability for all of the districts of the city, and in addition the basic census data is also available for Census tracts.

VIII. RESOLVING THE GAP

It is evident that there might frequently occur a gap between the rent the developer must charge and the rent that prospective tenants can afford to pay. In the numerical example for Roxbury that gap proved to be quite large. In fact it did not even come close to being resolved after it was assumed that there was:

1. A land write-down subsidy through the redevelopment process
2. A tax concession
3. A direct-grant subsidy for construction of 50% of the cost.

Under these particular circumstances illustrated in the numerical example, it is apparent that from an economic point of view, there is substantial question about the feasibility of residential redevelopment in Roxbury at least insofar as providing new housing for the present population is concerned. Resolving the problem is of course beyond the scope of this paper which is simply a description of the method of analysis. Obviously where feasibility proves to be highly questionable, what must be called into play is a basic reappraisal of initial policies and land planning design.

IX. OTHER REFERENCE SOURCES

The method described here is a simplification of the method described in:

Leon Pollard, "Financial Variables in Rental Housing", Journal of the American Institute of Planners, Vol. XXII, No. 2, Spring 1956.

Other References:

Louis Winnick, Rental Housing: Opportunities for Private Investment, A.C.T.L.O.N., McGraw-Hill Book Co., N.Y., 1958.

FHA, Testing the Soundness of Rental Housing Projects, US Government Printing Office.

Fisher & Fisher, Urban Real Estate, Henry Holt & Co., N.Y., 1954

N. Preston Breed, "Commercial Banker Presents Primer for Potential Real Estate Investors," Boston Sunday Herald, Aug. 10, 1958, Sec. IV, p. A5.

There is, in addition a complete file of work done in this field and additional references in the Research Division.